Mobile cognitive therapy

Kok, Gemma; Bockting, Claudi; Burger, Huibert; Smit, Filip; Riper, Heleen

Published in:
Internet Interventions

DOI:
10.1016/j.invent.2014.05.002

Publication date:
2014

Internet Interventions 1 (2014) 65–73

Contents lists available at ScienceDirect

Internet Interventions

journal homepage: www.invent-journal.com/

Mobile Cognitive Therapy: Adherence and acceptability of an online intervention in remitted recurrently depressed patients ☆

Gemma Kok [a], Claudi Bockting [a,*], Huibert Burger [b,c], Filip Smit [d,e,f,g], Heleen Riper [d,f,h]

[a] Department of Clinical Psychology, University of Groningen, Groningen, The Netherlands
[b] Department of General Practice, University of Groningen, University Medical Center Groningen, Groningen, The Netherlands
[c] Interdisciplinary Center of Psychopathology and Emotion Regulation, University of Groningen, University Medical Center Groningen, Groningen, The Netherlands
[d] Department of Clinical Psychology, VU University Medical Centre, Amsterdam, The Netherlands
[e] Department of Epidemiology and Biostatistics, VU University Medical Centre, Amsterdam, The Netherlands
[f] EMGO + Institute for Health and Care Research, VU University and VU University Medical Centre, Amsterdam, The Netherlands
[g] Trimbos Institute, Netherlands Institute of Mental Health and Addiction, Utrecht, The Netherlands
[h] Leuphana University, Lüneburg, Germany

ARTICLE INFO

Article history:
Received 30 April 2014
Received in revised form 15 May 2014
Accepted 15 May 2014
Available online 4 June 2014

Keywords:
Internet-based therapy
Recurrent depression
Uptake
Adherence

ABSTRACT

Background: There are first indications that an Internet-based cognitive therapy (CT) combined with monitoring by text messages (Mobile CT), and minimal therapist support (e-mail and telephone), is an effective approach of prevention of relapse in depression. However, examining the acceptability and adherence to Mobile CT is necessary to understand and increase the efficiency and effectiveness of this approach.
Method: In this study we used a subset of a randomized controlled trial on the effectiveness of Mobile CT. A total of 129 remitted patients with at least two previous episodes of depression were available for analyses. All available information on demographic characteristics, the number of finished modules, therapist support uptake (telephone and e-mail), and acceptability perceived by the participants was gathered from automatically derived log data, therapists and participants.
Results: Of all 129 participants, 109 (84.5%) participants finished at least one of all eight modules of Mobile CT. Adherence, i.e. the proportion who completed the final module out of those who entered the first module, was 58.7% (64/109). None of the demographic variables studied were related to higher adherence. The total therapist support time per participant that finished at least one module of Mobile CT was 21 min (SD = 17.5). Overall participants rated Mobile CT as an acceptable treatment in terms of difficulty, time spent per module and usefulness. However, one therapist mentioned that some participants experienced difficulties with using multiple CT based challenging techniques.
Conclusion: Overall uptake of the intervention and adherence was high with a low time investment of therapists. This might be partially explained by the fact that the intervention was offered with therapist support by telephone (blended) reducing non-adherence and that this high-risk group for depressive relapse started the intervention during remission. Nevertheless, our results indicate Mobile CT as an acceptable and feasible approach to both participants and therapists.

1. Introduction

Major Depressive Disorder (MDD) is a chronically relapsing disease (Richards, 2011), with a high risk of depressive relapse (Burcusa and Iacono, 2007). Each episode of depression leads to considerable economic costs to the society (Johnson et al., 1992; Keller and Boland, 1998; Richards, 2011; Smit, 2009). Prevention of relapse is therefore of great importance. However, waiting lists due to scarcity of therapists are common (Cameron and Thompson, 2005). Therefore, an Internet-based Cognitive Therapy might be a feasible approach, given that it is easily accessible and therapist involvement may be reduced, as demonstrated in acute phase Internet-based treatment (Wright et al., 2005). Meta-analyses demonstrated small to moderate effect sizes of Internet-based therapies in the acute phase of depression, anxiety, panic disorders and alcohol use disorders (Andersson et al.; Andersson and Cuijpers, 2009; Lewis et al., 2012; Richards and Richardson, 2012; Riper et al., 2011; Spek et al., 2007). In addition, first results of psychological treatment by using a smartphone app are positive as well (Ly, 2012; Ly, 2014).

☆ Nederlands Trial Register http://www.trialregister.nl/trialreg/admin/rctview.asp?TC=2503, number: NTR2503.

* Corresponding author at: University of Groningen, Department of Clinical Psychology, Grote Kruisstraat 2/1, 9712 TS Groningen, The Netherlands. Tel.: +31 50 3636479.
E-mail address: C.L.H.Bockting@rug.nl (C. Bockting).

http://dx.doi.org/10.1016/j.invent.2014.05.002

In addition, there are first indications that the effects of guided self-help interventions (blended care), such as Internet-based psychotherapy, might be comparable to face-to-face psychotherapy, although this is less clear to patients seeking help in speciality care (Andersson et al., 2013; Cuijpers et al., 2010).

Although it was demonstrated that Internet-based therapies are effective in treating various (mental) health problems, most studies were performed in patients with acute problems. So far, only one study has examined an internet-based cognitive behavior therapy (CBT) compared to a control group as a relapse prevention strategy in depressed patients that responded to treatment but were partially remitted (Holländare et al., 2011; Holländare et al., 2013). Now for the first time, an Internet-based preventive Cognitive Therapy aimed at relapse prevention of a new episode in patients remitted for at least two months, including mood monitoring by making use of text messages and minimal therapist support by telephone and e-mail (Mobile-CT) was developed and evaluated (Bockting and van Valen, 2009; Bockting, 2009). Recently, in a randomized controlled trial ($N = 239$), we demonstrated that Mobile CT significantly reduced depressive symptoms levels measured with the Inventory of Depressive Symptomatology (IDS-SR_{30}), over three months of follow-up compared to Treatment as Usual in fully remitted participants with recurrent depression (Cohen's $d = 0.44$; Kok et al., 2014 *under review*).

Apart from these effects on return of depressive symptomatology, understanding how and to what extent an intervention is used is critical to increase the efficiency and efficacy (Eysenbach, 2005). According to the model of Internet-based interventions by Ritterband et al. (2009), based on multiple theories and models, factors such as user characteristics, adherence, support and website characteristic all influence the usage of the Internet-based intervention. In the current study, after we described the details of the Mobile CT program that was developed, the following facets were examined to evaluate the use of Mobile CT: 1) the user characteristics of participants in relation to adherence, 2) therapist support uptake, and 3) experienced difficulties based on some experiences of participants and therapists and evaluations filled in by participants after each module of Mobile CT.

2. Method

In this study we used a subset of a randomized controlled trial on the effectiveness of Mobile CT aimed at the prevention of depressive relapse (the first 129 participants that entered the study and were currently available for analyses) (Bockting et al., 2011). Participants were recruited via media, general practitioners and mental health services. The present quantitative and qualitative analyses were performed in the participants that were randomized into the Mobile CT added to TAU condition. Participants were a) between 18 and 65 years of age, and b) in remission of recurrent MDD for at least two months, but no longer than two years according to DSM-IV-TR as assessed using the Structured Clinical Interview based on the Diagnostic and Statistical Manual of Mental Disorders (SCID-I, DSM-IV-TR) (First et al., 2001) and had a maximum score of 10 on the 17-item Hamilton Rating Scale for Depression ($HRSD_{17}$) (Hamilton, 1960). Excluded participants had 1) a predominant anxiety disorder, 2) current or past mania or hypomania, 3) current alcohol- or drug abuse, and 4) past or present psychosis based on the SCID-I interview. Additionally those persons with insufficient mastery of the Dutch language, recent electroconvulsive therapy or organic brain damage were not included. The study was approved by the Medical Ethics Committee of the University Medical Center Groningen and all participants provided written informed consent.

2.1. The Mobile Cognitive Therapy

Mobile CT consists of Internet-based Preventive Cognitive Therapy (PCT), telephone delivered psychotherapy (telemental health) and mood monitoring via text messages and e-mail. Mobile CT consists of eight modules with a fixed structure and is an adapted form of PCT. PCT is an effective eight session face to face intervention aimed at the prevention of relapse in remitted but recurrently depressed patients (Bockting et al., 2005, 2009). When participants log into the web-based intervention, they first see the "cockpit" (Fig. 1), which consists of 1) an overview of the eight modules, 2) mood monitor information, and 3) e-mail communication with their therapist (coach). Via the cockpit other parts of the intervention can be assessed as well, such as additional prevention of relapse information and a personal workbook in which participants can save exercises from the modules. The workbook further contains records of negative and positive thoughts and feelings. The workbook can be personalized by adding a photo of oneself and writing a motivational message to oneself. After study participants logged in for the first time, they were obliged to fill in whether they wanted to receive the mood monitor and reminders via text messages by mobile telephone or e-mail. Access to subsequent modules is only granted after finishing the previous module. Each module consists of text and video based information and assignments that can all be finished in approximately 20 min. In the present study, participants were advised to finish around one module each week, but were told to repeat modules as often as they wanted. Every study participant had access to Mobile CT for one year and could log in as often as they wanted, also after finishing all modules. Mobile CT has been developed in a collaboration between the University of Groningen and the Trimbos-Institute (Netherlands Institute of Mental Health and Addiction).

2.1.1. Mobile mood monitoring

Twice a month, participants received a reminder via a text message (or e-mail on request by the participant) to fill in the mood monitor. The mood monitor consists of two questions about last week's mood and interests, in order to check the two key symptoms of depression (American Psychiatric Association, 2010), to be answered on a scale of 1 to 10. In case a decrease in mood or interests occurred twice in a row (score of <3), participants received an automatic request to fill in the 16 item Quick Inventory of Depressive Symptomatology (QIDS) (Rush et al., 1996). In case the outcome of the QIDS was a score above 10, or indicated suicidal ideation, the researchers checked return of a depressive episode with an interview (i.e. the $HRSD_{17}$ and the depression section of the SCID-I). In case the $HRSD_{17}$ score was ten or higher and the SCID-I was indicative of a depressive relapse, participants were advised to contact their general practitioner or therapist.

2.1.2. Automatic feedback and reminders

Each participant received friendly reminders by text message or e-mail to proceed with the intervention after absence to the website for six weeks. Further, in the beginning of each module after the first, participants were asked if they finished the assignment in the previous module. Depending on their answer, participant received automatic feedback. For example, when a participant filled in that the previous exercise was performed, the system answered: *Very good!* By practicing with assignments you do not only learn the theory but also learn how to apply this in daily life. This makes the training more effective. When a participant filled in that the previous exercise was not performed, the system answered: *Too bad!* By doing assignments you not only learn the theory, but also learn how to use this in daily life. This will make the training more effective. What was the reason for not doing the exercise?

2.1.3. Therapist support

The main aim of overall support was to help participants with the exercises and work through the modules. Participants were assigned to a therapist and approached through e-mail by the researchers to schedule two telephone support sessions with this therapist. In case of no response, participants received friendly reminders by e-mail and

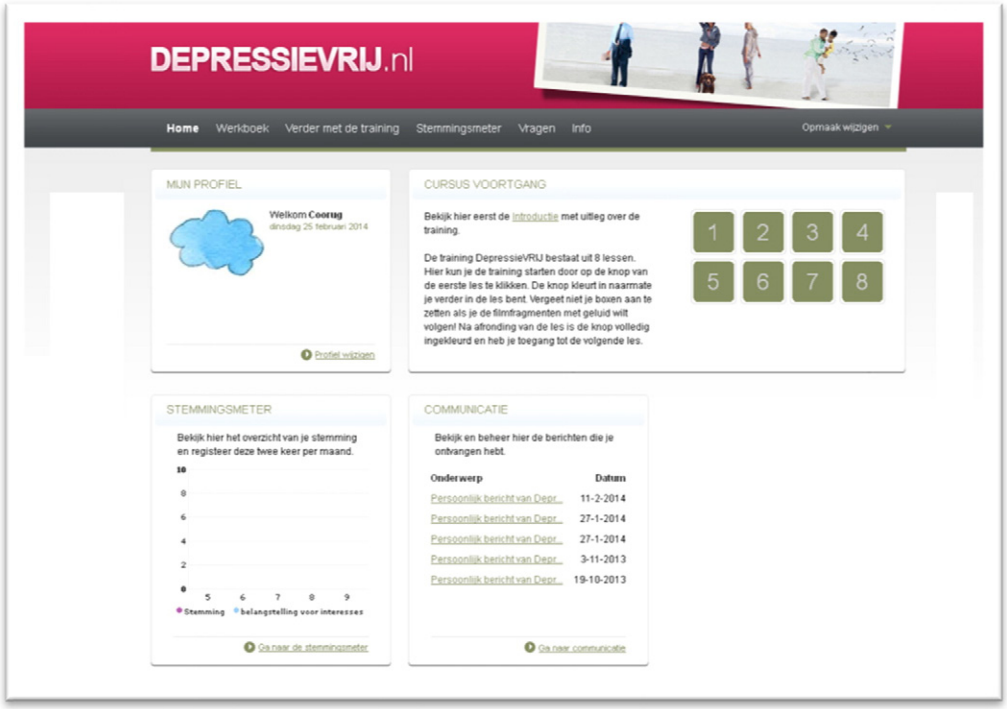

Fig. 1. Cockpit of the Mobile CT intervention "Depressionfree".

telephone, with a maximum of four attempts. Four licensed clinical psychologists, received a one-day training in Mobile CT, including a training in blending the Mobile CT with telephonic, and e-mail support. All therapists received a short protocol for each telephone session (for the protocol see Figs. 1 and 2). The telephone support sessions were scheduled around modules two and five. These telephone sessions were only scheduled when participants reached these modules. We chose modules two and five because in our pilot we had some indications that these modules were the most complicated and to prevent dropout. Additional telephone support sessions were on demand of the participant, with a maximum of two. E-mail contact with the therapist was not scheduled and could be initiated by all participants without restrictions to the quantity.

To promote protocol integrity of therapists, regular Skype meetings were held with all therapists, in which for instance a question like how to deal with difficulties with applying challenging techniques was discussed. Before starting with Mobile CT, all participants received standardized information through telephone and e-mail in which they were informed about the modules after which there would be approached telephone sessions with their therapist and the option to ask for additional sessions (with a maximum of four appointments in total) and initiate e-mail contact with their therapist without restrictions to the quantity.

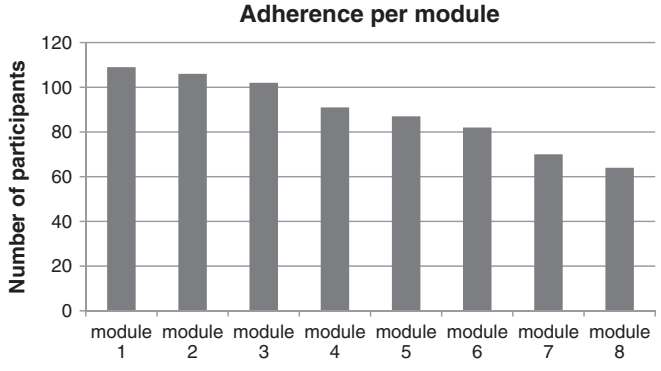

Fig. 2. Number of participants that finished the modules.

Box 1
Therapist protocol for telephone support session one.

Therapist protocol telephone support session one

Before the appointment:
- Check the evaluation by the participant
  - o Were there any questions or remarks
- Check the decision letter (if possible)
  - o Did the participant formulate a dysfunctional belief?

Start:
- Mention that the support session is aimed at extra explanation and helping with the modules
- How did it go, any difficulties?
- Did participant manage to formulate a dysfunctional belief? If yes, compliment! Check whether belief is related to the participant. Use downward arrow technique when needed. If no, help participant choose one
- It is possible to repeat the modules in case a participant wants to work on more than one belief
- Any questions/remarks
- Closing

Box 2
Therapist protocol for telephone support session two.

Therapist protocol telephone support session two

Before the appointment:
- Check the evaluation by the participant
  - o Were there any questions or remarks
- Check the assignment of module four
  - o Did the participant choose a positive (dream) belief?
- Check (if possible) assignment of module five
  - o Did participant manage to assign characteristics to the belief?
- In case the participant is at module seven, check the status of the behavioral experiment

Start:
- Mention that the support session is aimed at extra explanation and helping with the modules
- How did it go, any difficulties?
- Did participant manage to formulate a positive/dream belief? If yes, compliment! When needed use CT based challenging techniques acquired through Mobile CT training
- If needed help with assigning characteristics to positive/dream belief as well
- Any questions/remarks
- Closing

2.2. Data collection

2.2.1. User characteristics

As part of the randomized controlled trial, age, education, gender, marital status, number of previous episodes and remission status of all participants allocated to Mobile CT were assessed with the baseline interview using the SCID-I and the $HRSD_{17}$. The SCID-I was administered by trained researchers over the telephone. The two most recent episodes of depression were assessed at symptom level in the SCID-I interview. All other episodes were assessed by the core DSM-IV-TR criteria depressed mood (A1) or loss of interest (A2). The $HRSD_{17}$ is a semi-structured clinical interview to assess depressive symptoms. Scores can range from 0 to 52 (Hamilton, 1960). After the interview, participants received self-report questionnaires through e-mail. The Dutch translation of the Inventory of Depressive Symptomatology was used to measure depressive symptoms at baseline (Rush et al., 1996). The inventory consists of 30 items to be answered on a 4-point scale, ranging from 0 (no symptom) to 3 (almost always troubled by symptom).

2.2.2. Website and Internet intervention: usage and acceptability

First a description of the website and Internet-based intervention was given. Further, we examined the total number of modules finished and defined adherence, in line with Hilvert-Bruce et al. (2012), as the proportion of patients that started the first module who completed the final module. We used the log data to extract the number of participants that finished each module. In addition, the total number of logins was derived from the log data. After each module participants filled in an evaluation about the perceived usefulness (very useful–not at all useful), perceived difficulty (very easy–difficult) and time spent on the module (less than 30 min–more than 120 min). This automatically derived information was used to examine the acceptability of the website to the participants. In addition, information on intervention dropout per module and the qualitative experiences of therapists and participants were used to describe the difficulties with the website modules.

2.2.3. Therapist support

The total therapist support time per participant was calculated based on the information we received from the therapists. Therapist got paid based on support time in minutes. To calculate the total time per participant we added the time of the telephone sessions and time spent on reading and answering e-mails. In addition, the number of e-mails and telephone support sessions of each participant was gathered through the therapists and log data to assess the amount of therapist support needed in remitted, recurrently depressed patients.

2.3. Statistical analysis

The quantitative analyses were performed using SPSS version 20.0 and we considered 2-tailed p-values $< .05$ to be statistically significant. The user characteristics of participants that finished all modules where compared to participants who did not start at all and participants who followed at least one module out of all eight modules. Chi square tests were used to test differences in dichotomous variables and independent sample t-tests were applied to normally distributed continuous variables, for non-normally distributed variables the non-parametric Mann–Whitney U statistic was used. In addition, bivariate Pearson correlations were used to study associations between user characteristics and the number of finished modules on the one hand, and the evaluated difficulty, usefulness, and time spent on modules on the other.

3. Results

3.1. User characteristics

Data of 129 participants allocated to the Mobile CT was available. In Table 1 the baseline characteristics of the participants are presented. The baseline depression scores were low in all patients because our inclusion criterion was a remission status and a $HRSD_{17}$ score equal to or below 10. The depression scores on the $IDS\text{-}SR_{30}$ fall into the category mild symptoms. Most participants were female (79.1%) and 41.1% received higher education. Most baseline characteristics of participants that completed all modules did not significantly differ from participants that finished at least one module and the total group of participants randomized in to Mobile CT (all p's $> .05$). However, a higher degree of the participants that did not start with Mobile CT ($n = 20$) was unmarried, compared with participants that finished at least one module or all eight modules of Mobile CT (respectively, 60.0% versus 31.1% and 18.8%, $p = .009$). Further, participants that finished all eight modules had a somewhat higher score on baseline depressive symptoms measured with the $IDS\text{-}SR_{30}$ than participants that started the first module but did not complete all modules ($M = 16.84$, $SD = 11.3$ versus $M = 15.21$, $SD = 8.4$, $p < .036$). In addition participants that did not finish the first module had a significantly higher score on depressive symptoms measured with the $IDS\text{-}SR_{30}$ compared with participants that did finish the first module, but not all eight modules ($M = 17.95$, $SD = 12.4$ versus $M = 15.21$, $SD = 8.4$, $p = .014$). Finally, none of the user characteristics was associated with a higher number of finished modules and a higher number of total logins (all p's $> .05$).

3.2. Website/Intervention content

Each module has a fixed structure, with agenda setting, an evaluation of homework with automated feedback, the explanation of the rationale of each module and homework assignments. The content of all modules was based on a treatment manual (available on request from Claudi L.H. Bockting) (Bockting, 2009). All modules end with a

Table 1
Baseline demographic and descriptive characteristics of the study intervention population (N = 129).

	Assigned to Mobile CT, but did not finish the first module (N = 20)	Finished at least one module, but not all eight modules (N = 45)	Finished all eight modules (N = 64)
Age, mean (SD)	42.1 (12.1)	45.4 (10.4)	47.4 (10.7)
Female gender, no. (%)	16 (80.0)	37 (82.2)	49 (76.6)
Marital status, no. (%)			
Single	12 (60.0)	14 (31.1)	12 (18.8)
Married or cohabiting	7 (35.0)	24 (53.3)	43 (67.2)
Divorced	0 (0.0)	5 (11.1)	3 (4.7)
Widowed	0 (0.0)	0 (0.0)	2 (3.1)
Missing	1 (5.0)	2 (4.4)	4 (6.3)
Education, no. (%)			
Primary school	0 (0.0)	1 (2.2)	0 (0.0)
Secondary education	0 (0.0)	1 (2.2)	3 (4.7)
Vocational education	8 (40.0)	14 (31.1)	17 (26.6)
Pre-university education	1 (5.0)	0 (0.0)	1 (1.6)
Higher education	8 (40.0)	18 (40.0)	27 (42.2)
University	3 (15.0)	9 (20.0)	13 (20.3)
Missing	0 (0.0)	2 (4.4)	3 (4.7)
Previous episodes MDD, median (IQR)	4.0 (3.75)	4.0 (3.0)	4.0 (2.0)
Depressive symptomatology, $HDRS_{17}$, mean (SD)	3.90 (2.7)	3.49 (2.8)	3.62 (2.9)
Depressive symptomatology, $IDS\text{-}SR_{30}$, mean (SD)	17.95 (12.4)	15.21 (8.4)	16.41 (11.3)

Note, SD = Standard deviation; MDD = Major Depressive Disorder; IQR = Interquartile Range; $HDRS_{17}$ = Hamilton Rating Scale for Depression; $IDS\text{-}SR_{30}$ = Inventory of Depressive Symptomatology.

short evaluation about the difficulty, usefulness and time spent on a module, and an option to save helpful exercises in a workbook. Further, in each module two videos can be viewed, one where a patient explains an exercise and one by an expert that explains the content. The online intervention consists of three main components:

1) Identification and changing dysfunctional beliefs
2) Enhancement of positive experiences, by keeping a diary
3) Formulating relapse/recurrence prevention strategies.

In the first module the main aim is the identification of negative thoughts. During the second module participants have to identify their dysfunctional beliefs, with help of a self-report questionnaire (Dysfunctional Attitude Scale) (Weissman, 1979). The participants were encouraged to examine whether they can explain what life circumstances contributed to the development of this specific belief. Module three consists of weighing the advantages and disadvantages of the dysfunctional belief, resulting in making a decision whether or not to continue examining the belief. A decision letter is written when the participant decides to change the dysfunctional belief. In modules 4–7, multiple cognitive therapy based challenging techniques were used that focus on dysfunctional beliefs, such as identifying positive/dream beliefs and subsequently applying the multidimensional technique (Bockting and van Valen, 2009; Bockting et al., 2009). After formulating an alternative belief, in module seven participants practice with this new belief by making a flashcard. A behavioral experiment can be done as an option to reinforce the new belief. In modules 4–6 participants were asked to keep a diary of positive experiences and feelings. In modules 5–8, participants formulate specific relapse/recurrence prevention strategies. All information gathered throughout the modules was used to make a personal prevention plan in module eight, in which prevention strategies were included, such as visiting friends, calling someone, or exercising regularly.

3.3. Intervention usage/adherence

Of the 129 participants randomized to the Mobile CT group, 109 participants finished the first module and 64 participants finished all eight modules. The rate of participants that finished at least one module was 84.5% (109/129 participants). Full adherence (all eight modules finished) therefore was 58.7% (64/109 participants). Out of all participants, the average number of total logins was 25.3 (SD = 22.7), in participants that finished at least one module but not all eight this was 18.84 (SD = 16.9) and in participants that finished all eight modules this was 37.0 (SD = 22.7). The mean of finished modules in participants completing at least one module was 5.5 (SD = 3.1). A somewhat higher part of the dropouts, occurred after module three (n = 11) and module six (n = 12). However, the intervention dropout in Fig. 2 shows a gradual decline over time of participants that completed each module.

3.4. Acceptability of the website based on evaluations

Figs. 3 to 5 present the evaluations on usefulness, difficulty and time spent per module. Most participants rated the modules one to seven as useful and module eight as very useful. The ratings 'not useful' and 'not at all useful' were only given in module two to six and after module six were not given at all anymore, which might mean the modules after module six were more useful or that participants already dropped out after the previous modules or before filling in the evaluation. The same applies to the difficulty; most participants rated all modules as

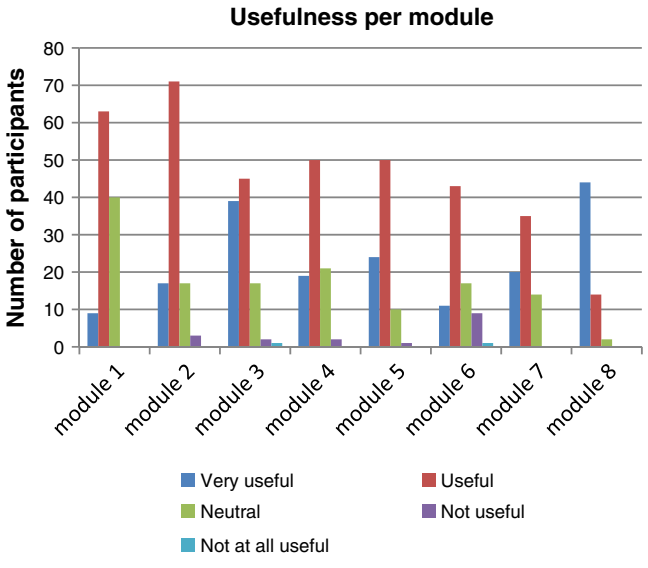

Fig. 3. Evaluation of usefulness per module.

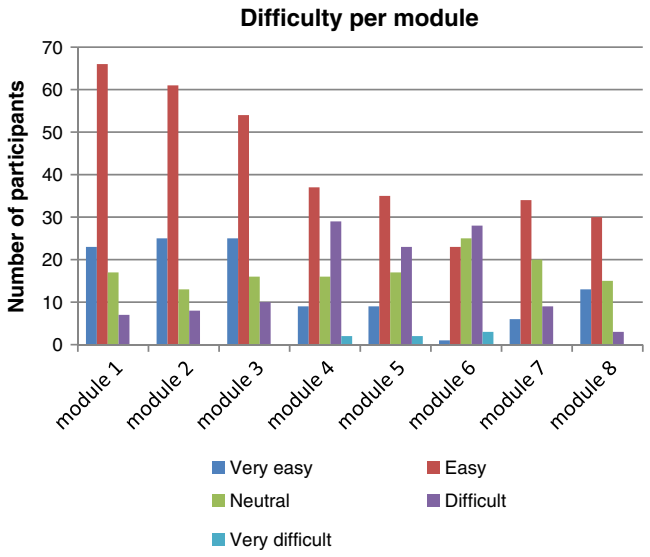

Fig. 4. Evaluation of difficulty per module.

easy. The modules four, five and especially six were rated as difficult. This might explain the relatively high intervention dropout after module six (n = 12, 11%), instead of the initial rapid decline often demonstrated with Internet-based treatments (Eysenbach, 2005). However, participants did not rate module three as more difficult, while intervention dropout was relatively high after this module as well. The evaluations on usefulness and difficulty of all modules were not associated with the number of finished modules (all *p*'s > .05).

3.5. Time spent per module

The time spent by participants per module mostly varied from 30 to 60 min. The amount of time was not associated with the number of finished modules as well (all *p*'s > .05). This indicates that the time spent on the modules was not related to adherence. In module six a significantly higher percentage of participants (longer than 2 h: 9.2% in module six versus 0.9%–4.6% for other modules) spend a longer amount of time on the module than in the other modules ($p < .05$). The amount of time spent might therefore be related to the difficulty. Indeed statistically significant correlations of small to moderate size were found between difficulty of the module and the time spent on the module (with the exception of module one) (range of correlations per module $r = .233–.381$).

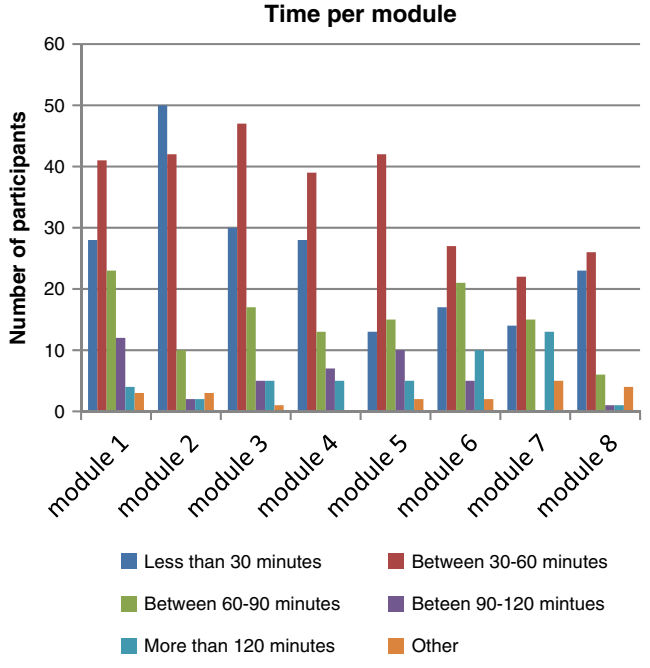

Fig. 5. Evaluation of time spent per module.

3.6. Qualitative analysis: experiences mentioned by therapists and participants

A few participants and one therapist voluntarily informed us about the experiences with the online intervention of Mobile CT. According to these participants, doing the intervention was helpful and easy to perform. Some participants mentioned that the flashcard was very helpful. Conversely also some difficulties were mentioned. In module three participants had to weight the advantages and disadvantages of their dysfunctional beliefs and had to decide whether or not to continue work on challenging this rigid belief (Bockting and van Valen, 2009; Bockting, 2009). For instance for the belief: "*people will appreciate me less when I make a mistake*", an advantage might be that such a person often delivers high quality work that will satisfy his/her employer. A disadvantage could be that this may costs a lot of time/energy and is stressful for the participant. During the telephone session after module two, one therapist noticed that some participants had trouble with selecting a specific dysfunctional belief out of the provided list with examples of dysfunctional beliefs (Dysfunctional Attitude Scale) (Weissman, 1979). Further, some participants reported having trouble rating the characteristics of their dysfunctional belief. The therapist had the impression that drawing final conclusions based on this assignment was sometimes hard. While we expected that formulating an extreme positive belief would be difficult, according to therapist and participants this was not the case. Conversely, some participants mentioned having difficulty with module six were participants who had to draw conclusions based on their assigned scores. Focusing the therapist support sessions on these evaluations, and especially assisting with drawing conclusions, might be helpful for participants who have difficulties with this part. Also, a participant said: "*what might help is to give a written example of how to draw conclusions*" (received through personal communication). Although we used written and video based examples of how to perform the assignments in each module and added videos, with regard to drawing conclusions it might help to add an extra example of this. Further, according to the therapist, few participants carried out the behavioral experiment. This was an optional module that might not be necessary to include. In Internet-based therapies more help with setting up an experiment might be needed.

3.7. Therapist support uptake

The mean amount of total therapist support time per participant (telephone and e-mail) who completed at least one module of Mobile CT was 21 min (SD = 17.5). This is less than mostly reported in other studies where the total time is around 60 min (Marks et al., 2003; Proudfoot et al., 2004), and approximately 150 min for an Internet-based cognitive behavior therapy consisting of 10 email guided modules with additional 6 optional modules aimed at relapse prevention in partially remitted patients (Holländare et al., 2011). In Table 2 the therapist support uptake is presented for participants who finished at least one module of Mobile CT and participants who finished al eight modules. All participants were approached for the first telephone session with the therapist after they finished the second module and all participants that finished the fifth module were approached for the second telephone sessions with the therapists. Not all participants (n = 66, 60.6%) were reached for the second therapist support session, because they did not finish the fifth module, did not respond to the invitation,

Table 2
Therapist support uptake via telephone and e-mail contact.

Modules finished	At least one, but not all eight, n = 45	All eight, n = 64
Second telephone support session, n (%)	12 (26.7)	31 (48.4)
E-mail contact, n (mean)	0 (0.0)	32 (2.0)
Total therapist support time (mean)	14 min (17.3)	23 min (16.9)

refused a second session or thought it was not necessary. In participants finishing at least one module, but not all eight, the total therapist support time per participant was around 14 min (SD = 17.3). In participants that finished all eight modules, total therapist support time per participant was around 24 min (SD = 16.6). Participants completing the first module, but not all eight, did not initiate e-mail contact. In addition, 50% (32/64) of the participants who completed all eight modules initiated an e-mail contact with their therapist with a mean frequency of 2.0 emails. E-mail contact was initiated by the participants which implies that therapists did not initiate it by themselves.

4. Discussion

In the current study we examined the usage of Mobile CT aimed at preventing relapse and recurrence in remitted, recurrently depressed patients. In our study, treatment adherence (58.7%) was comparable to the overall reported adherence to guided web-based interventions for health problems in the extensive meta-analysis by Richards and Richardson (2012) with an adherence rate ranging from 65.2%–72%. Remitted participants in general finished a high number of the modules (M = 5.5, SD = 3.1) and frequently logged in (M = 25.3, SD = 22.7). This might indicate that participants also logged in after finishing all modules, as was intended by the developers. Unfortunately this could not be checked because data on the exact login times was not available. Most participants in our study were female, highly educated and married or cohabiting, which is comparable to other studies on web-based interventions aimed at depressed individuals (e.g. Andersson et al., 2005; Holländare et al., 2011; Kessler et al., 2009). In contrast to previous findings, characteristics such as education level and depressive symptom levels were not associated with intervention completion in our sample (Christensen et al., 2009; Warmerdam et al., 2013). However, the participants that did not start with the intervention were more often unmarried than participants that finished at least one or all eight intervention modules. In addition, depressive symptoms in participants that finished at least one module, but not all eight modules, were lower than depressive symptoms in participants that did not finish the first module or finished all eight modules.

Remarkably, the therapist support in our study was minimal while adherence was comparable to other studies on guided Internet-based treatments, using more guidance time. Intervention dropout was relatively low and steady over time and did not demonstrate any specific patterns, such as initial rapid decline (Eysenbach, 2005). Treatment drop-out could be an indication of a negative effect of treatment, such as worsening of symptoms and nonresponse. Examination of drop-out is therefore highly important (Rozental et al., 2014). The uptake of therapist support in our study was very low, with only 21 min in total. Other studies report a mean support time of 60 min (Marks et al., 2003; Proudfoot et al., 2004), and approximately 150 min for an Internet-based cognitive behavior therapy aimed at relapse prevention in partially remitted patients (Holländare et al., 2011). Given that adherence was comparable to other guided Internet-based interventions and face-to-face interventions (e.g. Hilvert-Bruce et al., 2012; Richards and Richardson, 2012), this might suggests that even with less support, an Internet-based treatment might be effective. Interestingly, in our study a low number of participants responded to our request to schedule a second therapist support session by telephone. In addition, a low number of emails were send by participants to their therapist. This is in accordance to previous research demonstrating the low number of participants that initiated contact when this was not pre-scheduled (Marks and Cavanagh, 2009). In addition, it might also be that participants knew that support would be minimal and acted accordingly (Richards and Richardson, 2012). The low therapist support time might be an effect of the specific training therapist received in applying blended care including the restricted time frame for the telephone support sessions. Alternatively, since we included participants that were remitted, less support time is needed to complete the modules compared with guidance in acutely depressed patients. Treatment needs could fluctuate depending on the depression stage (Guidi et al., 2011), and during remission participants may have different treatment needs than during a depressive episode. Currently, there is a lot of uncertainty with regard to the required level and type of support that is needed in Internet-based psychotherapies (Donker et al., 2009). For example, recent research demonstrated that support by receptionists, nurses, lay people, research coordinators, administrative staff, or technicians might be as effective as support by a mental health professional (Richards and Richardson, 2012; Robinson et al., 2010).

Most participants rated the modules as useful and easy in the evaluations at the end of each module. Finishing the modules took around 30–60 min. This indicates that Mobile CT might be an acceptable treatment for most participants. The relatively high adherence rates might be caused by the intervention being developed in such a way that each module could be completed within approximately 20 min and participants could choose whether to read information, watch videos and do certain assignments such as the behavioral experiment. However, one therapist did notice that some participants experienced difficulties with some aspects of the specific challenging techniques (drawing conclusions). Whether this finding applies to other Internet-based treatments using this technique is unknown and more research will be needed to examine this. These results on intervention uptake might be limited to remitted patients.

4.1. Limitations and future directions

Unfortunately, no information was available in the log data on the date and amount of time spent by participants per module. This is an important limitation of this study. However, participants did fill in the amount of time spent per module in the evaluation at the end of each module. While we advised participants to finish around one module per week, we were not able to check whether they actually did this. However, from our previous study we do know that a high proportion (80%) of the completers finished the modules within three months (Kok et al., *under review*). However, participants did fill in the amount of time spent per module in the evaluation at the end of each module. Gathering information on the time needed to finish modules is relevant because there are indications that a higher intensity of treatment is associated with a higher effect size of face-to-face psychotherapy (Cuijpers et al., 2013). Whether this also applies to Internet-based psychotherapies is unknown. Further, we instructed participants to repeat modules as often as they wanted. However, because information on the dates of logins was not available, it is unsure how often it occurred that participants repeated modules. Therefore, when designing an Internet intervention it is very important to have a clear idea about what to put into the log data before the start of the study. In addition, the information with regard to the reported difficulties with multiple CT based challenging techniques was based on only a small proportion of participants and on experiences of one therapist. The therapist and participants mentioned these difficulties to the researchers on their own initiative. Because no standardized questionnaire was used to assess the experience with the challenging techniques, these findings might not be generalizable.

Further, the main aim of this study was to gain insight in the use of an Internet-based relapse prevention treatment in remitted

participants. Future comparative and/or randomized controlled studies are needed to replicate our findings.

Another limitation, to this and to most other studies on Internet-based therapies, is that there is no universally accepted measure of adherence to Internet-based treatments and multiple definitions of adherence exist, varying from frequency of logins, time on website and number of modules finished (Christensen et al., 2009). Comparing adherence rates between studies on Internet-based treatments is therefore complex. Defining and using a single universal definition is advised to better understand which factors influence treatment outcome. In addition, patients could adhere to the Internet-based intervention, while they might not adhere to therapist support and monitoring by text messages and e-mails. It would be important to differentiate between these different types of dropout to examine what factors have an impact on treatment outcome.

Further, all participants were recruited within the context of a randomized controlled trial and volunteered to participate in a study on Mobile CT. Participants were between the ages of 18 and 65, in remission of at least two previous depressive episodes. Therefore, it is unclear whether our results can be generalized to other populations. Finally, during the current study no information on the mood monitor was present and therefore its usage was not yet examined.

4.2. Conclusion

We demonstrated that the therapist support time in remitted recurrently depressed patients was low while intervention adherence of participants was relatively high. In addition, participants and therapists rated Mobile CT overall as usable, acceptable and user-friendly. Our results are a first indication that during remission, an Internet-based treatment as Mobile CT might be a feasible form of continued care that prevents return of symptomatology and relapse and recurrence in this chronic disease. However, replication is warranted. This relapse prevention strategy might warrant implementation in routine practice after consolidation of our first positive findings on depressive relapse (Kok et al., *under review*). Internet-based therapies increasingly become an integral part in mental health care and further studies on its uptake help to obtain insights on how to offer these treatments optimally in daily clinical practice.

Funding

This research is funded by ZonMW: The Netherlands Association for Health Research and Development, Department of Disease Management of Chronic Illnesses, grant number: 300020014. Full protocol information: http://www.biomedcentral.com/content/pdf/1471-244X-11-12.pdf. Funding sources did not play any role in the collection, analysis, and interpretation of the data; writing the manuscript or the decision to submit for publication.

Acknowledgments

We are very grateful to all participants for their participation in the study. Without them this study would not exist. Moreover, we would like to thank all recruitment sites for their efforts: Arkin, PsyQ (Amsterdam, Groningen and Rotterdam), participating General practitioners associated with the network General Practitioners VUmc. We also thank all therapists for supporting the Mobile CT. Finally, we are grateful to all master students, honor students, volunteers (especially Isabel Schmidt), and research assistants (especially Michelle van der Laan and Nicola Klein) for their help.

References

American Psychiatric Association, 2010. Practice guideline for the treatment of patients with major depressive disorder, third edition, 152, p. 1170 (October).

Andersson, G., Cuijpers, P., 2009. Internet-based and other computerized psychological treatments for adult depression: a meta-analysis. Cogn. Behav. Ther. 38 (4), 196–205. http://dx.doi.org/10.1080/16506070903318960.

Andersson, G., Bergström, J., Holländare, F., Carlbring, P., Kaldo, V., Ekselius, L., 2005. Internet-based self-help for depression: randomised controlled trial. Br. J. Psychiatry 187 (5), 456–461. http://dx.doi.org/10.1192/bjp.187.5.456.

Andersson, G., Hesser, H., Veilord, A., Svedling, L., Andersson, F., Sleman, O., Carlbring, P., 2013. Randomised controlled non-inferiority trial with 3-year follow-up of internet-delivered versus face-to-face group cognitive behavioural therapy for depression. J. Affect. Disord. 151 (3), 986–994. http://dx.doi.org/10.1016/j.jad.2013.08.022.

Andersson, G., Cuijpers, P., Carlbring, P., Riper, H., & Hedman, E. Internet-based vs. face-to-face cognitive behaviour therapy for psychiatric and somatic disorders: A systematic review and meta-analysis. Unpublished manuscript.

Bockting, C.L.H., 2009. Preventive cognitive therapy for recurrent depression. Bohn Stafleu van Loghum, Houten.

Bockting, C.L.H., van Valen, E., 2009. Ingredients of mobile preventive cognitive therapy for recurrent depression. University of Groningen, Groningen.

Bockting, C.L.H., Schene, A.H., Spinhoven, P., Koeter, M.W.J., Wouters, L.F., Huyser, J., Kamphuis, J.H., 2005. Preventing relapse/recurrence in recurrent depression with cognitive therapy: a randomized controlled trial. J. Consult. Clin. Psychol. 73 (4), 647–657. http://dx.doi.org/10.1037/0022-006X.73.4.647.

Bockting, C.L.H., Spinhoven, P., Wouters, L.F., Koeter, M.W.J., Schene, A.H., 2009. Long-term effects of preventive cognitive therapy in recurrent depression: a 5.5-year follow-up study. J. Clin. Psychiatry 70 (12), 1621–1628. http://dx.doi.org/10.4088/JCP.08m04784blu.

Bockting, C.L.H., Kok, G.D., van den Kamp, L., Smit, F., van Valen, E., Schoevers, R., Beck, A.T., 2011. Disrupting the rhythm of depression using mobile cognitive therapy for recurrent depression: randomized controlled trial design and protocol. BMC Psychiatry 11. http://dx.doi.org/10.1186/1471-244X-11-12.

Burcusa, S.L., Iacono, W.G., 2007. Risk for recurrence in depression. Clin. Psychol. Rev. 27 (8), 959–985. http://dx.doi.org/10.1016/j.cpr.2007.02.005.

Cameron, P.A., Thompson, D.R., 2005. Changing the health-care workforce. Int. J. Nurs. Pract. 11 (1), 1–4. http://dx.doi.org/10.1111/j.1440-172X.2005.00499.x.

Christensen, H., Griffiths, K.M., Farrer, L., 2009. Adherence in internet intervention for anxiety and depression: systematic review. J. Med. Internet Res. 11 (2), 1–16. http://dx.doi.org/10.2196/jmir.1194.

Cuijpers, P., Donker, T., van Straten, A., Li, J., Andersson, G., 2010. Is guided self-help as effective as face-to-face psychotherapy for depression and anxiety disorders? A systematic review and meta-analysis of comparative outcome studies. Psychol. Med. J. Res. Psychiatry Allied Sci. 40 (12), 1943–1957. http://dx.doi.org/10.1017/S0033291710000772.

Cuijpers, P., Huibers, M., Ebert, D.D., Koole, S.L., Andersson, G., 2013. How much psychotherapy is needed to treat depression? A metaregression analysis. J. Affect. Disord. 149 (1–3), 1–13. http://dx.doi.org/10.1016/j.jad.2013.02.030.

Donker, T., van Straten, A., Riper, H., Marks, I., Andersson, G., Cuijpers, P., 2009. Implementation of internet-based preventive interventions for depression and anxiety: role of support? The design of a randomized controlled trial. Trials 10 (1), 59.

Eysenbach, G., 2005. The law of attrition. J. Med. Internet Res. 7 (1), e11.

First, M., Spitzer, R., Gibbon, M., 2001. Structural clinical interview for DSM-IV-TR axis I disorders, research version patient edition with psychotic screen. New York State Psychiatric Institute, New York.

Guidi, J., Fava, G.A., Fava, M., Papakostas, G.I., 2011. Efficacy of the sequential integration of psychotherapy and pharmacotherapy in major depressive disorder: a preliminary meta-analysis. Psychol. Med. 41 (2), 321–331. http://dx.doi.org/10.1017/S0033291710000826.

Hamilton, M., 1960. A rating scale for depression. J. Neurol. Neurosurg. Psychiatry 23, 56–61.

Hilvert-Bruce, Z., Rossouw, P.J., Wong, N., Sunderland, M., Andrews, G., 2012. Adherence as a determinant of effectiveness of internet cognitive behavioural therapy for anxiety and depressive disorders. Behav. Res. Ther. 50 (7–8), 463–468. http://dx.doi.org/10.1016/j.brat.2012.04.001.

Holländare, F., Johnsson, S., Randestad, M., Tillfors, M., Carlbring, P., Andersson, G., Engström, I., 2011. Randomized trial of internet-based relapse prevention for partially remitted depression. Acta Psychiatr. Scand. 124 (4), 285–294. http://dx.doi.org/10.1111/j.1600-0447.2011.01698.x.

Holländare, F., Anthony, A., Susanne, Randestad, M., Tillfors, M., Carlbring, P., Andersson, G., Engström, I., 2013. Two-year outcome of internet-based relapse prevention for partially remitted depression. Behav. Res. Ther. 51 (11), 719–722. http://dx.doi.org/10.1016/j.brat.2013.08.002.

Johnson, J., Weissman, M.M., Klerman, G.L., 1992. Service utilization and social morbidity associated with depressive symptoms in the community. JAMA 267 (11), 1478–1483.

Keller, M.B., Boland, R.J., 1998. Implications of failing to achieve successful long-term maintenance treatment of recurrent unipolar major depression. Biol. Psychiatry 44 (5), 348–360.

Kessler, D., Lewis, G., Kaur, S., Wiles, N., King, M., Weich, S., Peters, T.J., 2009. Therapist-delivered internet psychotherapy for depression in primary care: a randomised controlled trial. Lancet 374 (9690), 628–634. http://dx.doi.org/10.1016/S0140-6736(09)61257-5.

Kok, G. D., Burger, H., Riper, H., Cuijpers, P., Dekker, J., van Marwijk, H., Bockting, C.L. H. The short-term effect of mobile internet-based cognitive therapy on the course of depressive symptoms in remitted recurrently depressed patients: Results of a randomized controlled trial. under review.

Lewis, C., Pearce, J., Bisson, J.I., 2012. Efficacy, cost-effectiveness and acceptability of self-help interventions for anxiety disorders: systematic review. Br. J. Psychiatry 200 (1), 15–21. http://dx.doi.org/10.1192/bjp.bp.110.084756.

Ly, K., Dahl, J., Carlbring, P., Andersson, G., 2012. Development and initial evaluation of a smartphone application based on acceptance and commitment therapy. SpringerPlus 1 (1), 11.

Ly, K., Trüschel, A., Jarl, L., Magnusson, S., Windahl, T., Johansson, R., Andersson, G., 2014. Behavioural activation versus mindfulness-based guided self-help treatment administered through a smartphone application: A randomised controlled trial. BMJ Open 4 (1). http://dx.doi.org/10.1136/bmjopen-2013-003440.

Marks, I., Cavanagh, K., 2009. Computer-aided psychological treatments: evolving issues. Annu. Rev. Clin. Psychol. 5, 121–141. http://dx.doi.org/10.1146/annurev.clinpsy.032408.153538.

Marks, I.M., Mataix-Cols, D., Kenwright, M., Cameron, R., Hirsch, S., Gega, L., 2003. Pragmatic evaluation of computer-aided self-help for anxiety and depression. Br. J. Psychiatry 183 (1), 57–65. http://dx.doi.org/10.1192/bjp.183.1.57.

Proudfoot, J., Ryden, C., Everitt, B., Shapiro, D.A., Goldberg, D., Mann, A., Gray, J.A., 2004. Clinical efficacy of computerised cognitive–behavioural therapy for anxiety and depression in primary care: Randomised controlled trial. Br. J. Psychiatry 185 (1), 46–54. http://dx.doi.org/10.1192/bjp.185.1.46.

Richards, D., 2011. Prevalence and clinical course of depression: a review. Clin. Psychol. Rev. 31 (7), 1117–1125. http://dx.doi.org/10.1016/j.cpr.2011.07.004.

Richards, D., Richardson, T., 2012. Computer-based psychological treatments for depression: a systematic review and meta-analysis. Clin. Psychol. Rev. 32 (4), 329–342. http://dx.doi.org/10.1016/j.cpr.2012.02.004.

Riper, H., Spek, V., Boon, B., Conijn, B., Kramer, J., Martin-Abello, K., Smit, F., 2011. Effectiveness of E-self-help interventions for curbing adult problem drinking: a meta-analysis. J. Med. Internet Res. 13 (2), 44–56. http://dx.doi.org/10.2196/jmir.1691.

Ritterband, L.M., Thorndike, F.P., Cox, D.J., Kovatchev, B.P., Gonder-Frederick, L., 2009. A behavior change model for internet interventions. Annals of Behavioral Medicine 38 (1), 18–27.

Robinson, E., Titov, N., Andrews, G., McIntyre, K., Schwencke, G., Solley, K., 2010. Internet treatment for generalized anxiety disorder: a randomized controlled trial comparing clinician vs. technician assistance. PLoS ONE 5(6).

Rozental, A., Andersson, G., Boettcher, J., Ebert, D.D., Cuijpers, P., Knaevelsrud, C., Carlbring, P., 2014. Consensus statement on defining and measuring negative effects of internet interventions. Internet Interv. 1 (1), 12–19. http://dx.doi.org/10.1016/j.invent.2014.02.001.

Rush, A.J., Gullion, C.M., Basco, M.R., Jarrett, R.B., 1996. The inventory of depressive symptomatology (IDS): psychometric properties. Psychol. Med. J. Res. Psychiatry Allied Sci. 26 (3), 477–486. http://dx.doi.org/10.1017/S0033291700035558.

Smit, F., 2009. Publieke geestelijke gezondheid:Analyse en, synthese. Trimbos-Instituut.

Spek, V., Cuijpers, P., Nyklícek, I., Riper, H., Keyzer, J., Pop, V., 2007. Internet-based cognitive behaviour therapy for symptoms of depression and anxiety: a meta-analysis. Psychol. Med. 37 (3), 319–328. http://dx.doi.org/10.1017/S0033291706008944.

Warmerdam, L., van Straten, A., Twisk, J., Cuijpers, P., 2013. Predicting outcome of internet-based treatment for depressive symptoms. Psychother. Res. 23 (5), 559–567. http://dx.doi.org/10.1080/10503307.2013.807377.

Weissman, A.N., 1979. The dysfunctional attitude scale: a validation study. ProQuest Information & Learning. Dissertation Abstracts International. 40(3), pp. 1389–1390 (1980–71511–001).

Wright, J.H., Wright, A.S., Albano, A.M., Basco, M.R., Goldsmith, L.J., Raffield, T., Otto, M.W., 2005. Computer-assisted cognitive therapy for depression: maintaining efficacy while reducing therapist time. Am. J. Psychiatry 162 (6), 1158–1164. http://dx.doi.org/10.1176/appi.ajp.162.6.1158.